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ENAMEL ON THE TEETH OF AN EOCENE EDENTATE[1]

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Edentates owe their rather inappropriate name to the occasional absence and constant degeneracy of the teeth. An outstanding indication of this degeneracy is the absence or very feeble development of enamel in all recent and most ancient forms.

As early as 1874 Tomes announced the discovery of an enamel organ in the embryonic nine-banded armadillo, but he maintained that at least a rudimentary enamel organ is universal in tooth germs and independent of possible later development of enamel. The observation of an enamel organ was several times repeated, but nothing suggestive of actual enamel was reported until Röse's paper of 1892. He stated that enamel was absent as such, but that there arose from the columnar ameloblasts a thin structureless layer lying directly on the dentine and apparently corresponding to Nasmyth's membrane. On the other hand, a paper by Ballowitz in the same year positively denied that enamel could be found at any time in the nine-banded armadillo, and considered the presence or absence of Nasmyth's membrane as indeterminate.

In 1904, however, Spurgin described embryos of this armadillo in which a thin layer of true enamel was present on the deciduous teeth. This was deposited later than the dentine, and precludes the possibility that Nasmyth's membrane could lie directly against the latter. He suggested that the layer seen by Röse might have been very thin enamel. This enamel presumably disappears as soon as the milk teeth come into use, and as yet no enamel seems to have been found on permanent teeth in recent members of this order.

These observations are valid evidence of the fact, so probable or certain from other phylogenetic considerations, that edentate teeth are degenerate and that the ancestral forms did have typical enamel-covered crowns. Theoretical interest centers very largely on the relative rate and time of loss of this tissue in the teeth. Opinions have varied from the view that it is one of the latest specializations, to belief that it is almost as ancient as the mammalian structure itself—for Ameghino, Thomas (at one time, later retracted) and some others have held that the simple edentate tooth structure is not degenerate but primitive and

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that the edentates are of separate ancestry from most or all other mammals.

As in all historical problems, conclusive evidence must be palæontological. Ameghino and Flower held that enamel did occur in some Miocene to Pleistocene fossil edentates, but these observations were disproven, chiefly by Burmeister and Scott. Until the present note, there seems to have been no record of enamel in functioning or permanent teeth of any xenarthran recent or fossil.

The North American Tæniodonta (Ganodonta of Wortman) have thick enamel of characteristic histologic structure and were formerly considered to be ancestral or related to the Xenarthra, but this view has been abandoned. The late Paleocene to Middle Eocene Palæanodonta of North America are clearly related to the Xenarthra, although subordinally distinct, and they have what is clearly enamel on the canines, although no thin sections have been made. The known cheek teeth show no definite enamel, but this may have been removed by wear. The known palæanodonts branched off from the pre-Xenarthra before the differentiation of the xenarthrans or even before their origin as such.

Direct investigation of the South American edentates has been very much retarded by the imperfect knowledge of any forms older than the Santa Cruz, Miocene. Particularly the edentates of the oldest fauna, the *Notostylops* fauna, all armadillos, so far as known, were represented only by scattered scutes and a few isolated bones that told almost nothing as to the actual structure of the group in the Eocene. The whole subject is now placed on a new basis by the discovery of a specimen, Amer. Mus. No. 28668, which includes both sides of the lower jaw, much of the skull, many endoskeletal elements, several groups of articulated scutes and many isolated scutes. It was found by C. S. Williams in the *Notostylops* Beds, fifty or sixty feet below the main fossil level of this locality, in the great barranca south of Lago Colhué-Huapí, Chubut Territory, Argentina. Ameghino's classification of the Eocene armadillos was based on isolated or doubtfully associated scutes. The various scutes of this one individual represent at least six of Ameghino's "species" and three of his "genera." From these and other possible synonyms, almost all published at the same time, I select the name *Utaetus buccatus* and apply it to our own specimen. It is as old as any applicable name and by Ameghino himself was more widely used than any other. The specimen appears to be a young adult, nearly full-grown but with epiphyses still open.

The specimen as a whole will be described later, the present note being confined to a brief description of the dentition.

The most striking feature is the presence of true enamel on the permanent teeth. This has been examined microscopically in thin sections, leaving no question as to its identification. It is thin, but typical of the simplest types of mammalian enamel. In the limited material

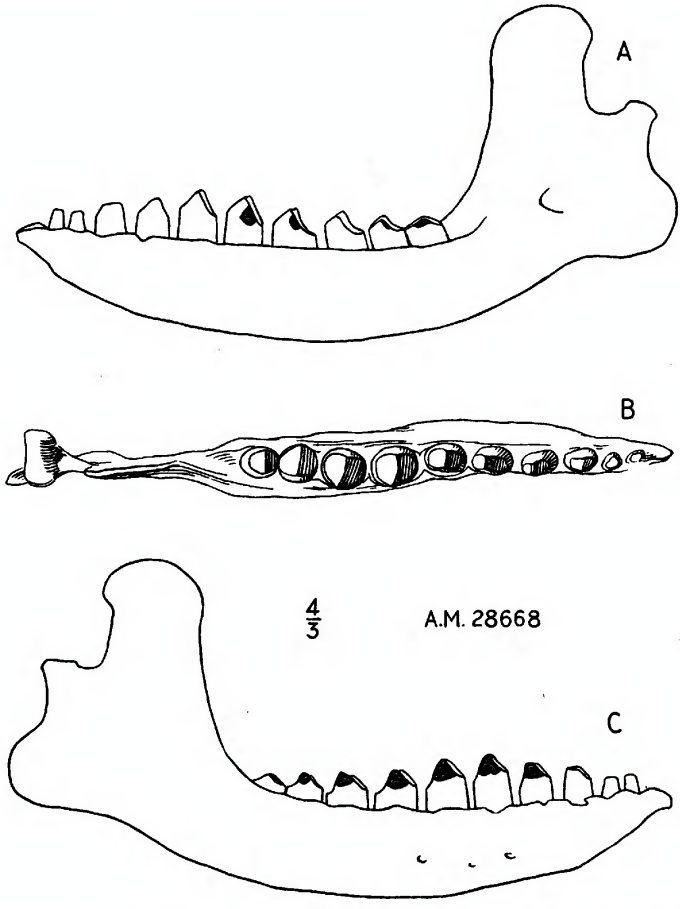

Fig. 1.—*Utaetus buccatus* Ameghino. Left lower jaw, Amer. Mus. No. 28668. A, Internal view. B, Superior view. C, External view. Enamel areas shown in black. Four-thirds natural size.

available for microscopic study, the enamel prisms appear to be straight, parallel, and simple, without any striking or unusual characters.

In the lower jaw there are ten teeth, occupying a space of 37.5 mm. The anterior, edentulous part of the ramus is unusually short, only 2.5 mm. The first two teeth are small and about equal. The third is ab-

ruptly larger and they then increase slightly in size to the seventh and eighth, then the ninth and tenth decrease somewhat. They are all simple and oval to nearly circular in section, and all trace of cusp structure has been removed by wear. The eighth and ninth teeth are nearly circular and the others more or less compressed laterally. All the teeth are deep, without closed roots, and clearly belong to the permanent dentition.

The distribution of enamel is clearly shown in the figures. None of the teeth has anterior or posterior enamel, doubtless because the wear facets here extend below the base of the true crown. Enamel is absent on the first three teeth, present on the outer and not on the inner side of the fourth and fifth, present on both sides of the sixth and seventh, the outer side only of the eighth, and both sides of the ninth and tenth but on very small areas.

Considering size, form, enamel distribution, etc., it is tempting to see vestiges of tooth differentiation into $I_2\ C_1\ P_4\ M_3$, but these indications may be secondary, and inference should not be pushed so far.

Utaetus is revealed as a true armadillo, primitive in the presence of enamel and in some other respects, but certainly a member of the Dasypodoidea and too advanced to be ancestral to glyptodonts or to ground sloths. Enamel being present on permanent and functioning teeth of this genus, it follows that it must have been present in the common ancestry of these three groups. It has therefore been lost independently at least three times in the evolution of the Xenarthra. This discovery also shows that the loss of enamel was one of the last outstanding specializations of the armadillos and was later than the acquisition of their typical tooth form and most of their other essential characters.

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